

UNITED STATES DISTRICT COURT EASTERN DISTRICT OF NEW YORK

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UNITED STATES OF AMERICA)	11-CR-414 (JBW)
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-against-)	
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LAWRENCE DICRISTINA)	
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Defendant.)	
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REPORT OF DR. DAVID DeROSA

August 9, 2012

Background and Qualifications

- 1) I am the president and owner of DeRosa Research and Trading, Inc., an economic consulting firm that is a member of the National Futures Association, founded in 1997.
- 2) DeRosa Research & Trading, Inc. does expert witness and litigation support work for cases involving equity trading, the foreign exchange market and related derivatives as well as structured finance, mortgage-backed securities, hedge funds, and short sales. I have testified as an expert more than fifteen times in Federal Court, where I have been qualified as an expert in multiple areas including: capital markets, investment management, investment and financial analysis, economics and finance with real world applications, and foreign exchange and options on foreign exchange.
- 3) Concurrent with my other professional experience, I have taught finance since 1996 at a number of universities. I currently teach courses in Pricing Models and Financial Engineering and Foreign Exchange and its Related Derivative Instruments for the financial engineering program at the Industrial Engineering and Operations Research Department, which is part of the Fu Foundation School of Engineering and Applied Science at Columbia University. I have also previously served on the faculties of Yale University, the University of Chicago, the University of Southern California, Loyola University of Chicago, and the University of Illinois at Chicago. A copy of my current CV is attached as Exhibit 1: David DeRosa's CV.

Scope of Engagement and Compensation

- 4) I have been asked by the U.S. Attorney's Office for the Eastern District of New York to review the report of Dr. Randal D. Heeb dated July 5, 2012. Specifically, I have been

asked to assess Dr. Heeb's analysis which he claims supports the proposition that skill predominates over chance in poker.

- 5) I have not been provided with any of the data or statistical analyses summarized in Dr. Heeb's report. A complete review of this information would take several months, but could very well uncover many factors that would be useful to the court. This report is, at best, my preliminary reaction to reading Dr. Heeb's report. I find that he has done an exhaustive amount of calculations. Because I do not have the underlying data, I am not in a position to assess the validity of these calculations. Moreover, I do not have the methodology he employed to create his skill index. What I am able to do, however, is discuss whether Dr. Heeb's stated results support his overarching conclusion, namely that skill predominates over chance in poker.
- 6) I respectfully submit to the court that Dr. Heeb has not proven his case. Moreover, I believe that the analysis in Dr. Heeb's report in some places demonstrates that chance is a material factor in poker, and in some other places serious reservations about his claims are warranted.
- 7) I note that the case at hand involves defendants convicted of operating illegal poker establishments in Staten Island, New York. Playing poker in a card room such as those operated by the defendants moves slower than online poker. For this reason, Dr. Heeb's analysis of online poker may be irrelevant to this case.
- 8) I have been compensated at a rate of \$450/hr. for my time. Other members of my firm were billed at their standard rates for such an engagement. My compensation is not dependent on my conclusions in this matter.
- 9) My work in this matter is ongoing and subject to change based on additional analysis or new information I may be provided.

Does Skill Predominate Luck in the Probability of a Player Winning at Poker

- 10) The subject of Dr. Heeb's report is an analysis of online poker.¹ Dr. Heeb claims that his analysis proves that over long periods of time "skilled" players perform better than "unskilled" ones so much so that skill predominates chance in poker. By long periods of time, I mean that Dr. Heeb's results are dependent on players subjecting themselves to hundreds if not thousands of hands of poker.
- 11) Dr. Heeb's report rests on two core assumptions that are erroneous. The first assumption is his definition of a winner. Dr. Heeb's analysis assumes that a player is interested primarily in his performance in comparison to other players. In reality, poker players play to win money. I believe a player considers himself a winner if he leaves the table with more money than he sat down with. The second assumption is that a player's performance should be considered exclusively over the very long run in determining the role of luck versus skill.
- 12) Additionally, Dr. Heeb's analysis lacks a proper treatment of players whether highly or poorly "skilled," who are unlucky at the onset and decide to quit on the spot or for other reasons play a limited number of hands. Indeed, as I will discuss, Dr. Heeb inexplicably classifies all cases of early quitting as the poorest "skills."
- 13) It is my opinion that Dr. Heeb does not prove that skill predominates chance in determining whether a player wins at poker.

¹ Specifically, Dr. Heeb's report analyzes hands of no-limit Texas Hold 'em played at PokerStars at various levels of betting.

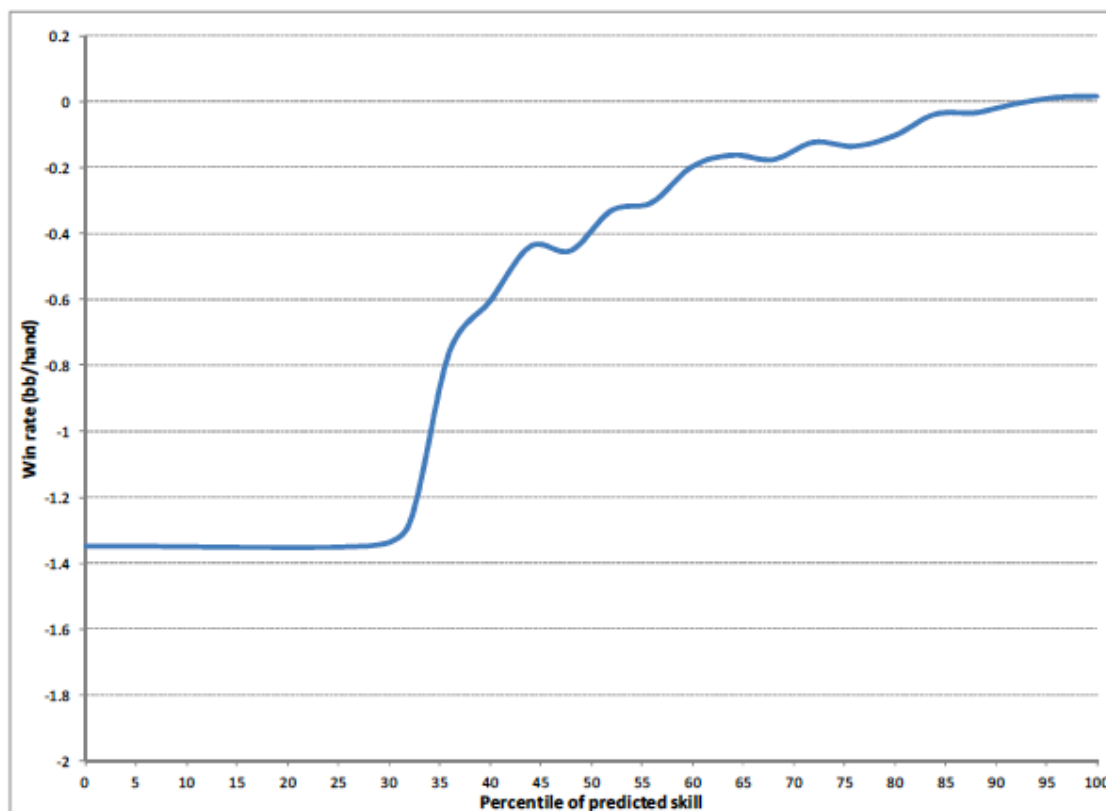
- 14) As I will discuss below, Dr. Heeb's own analysis shows that even skilled players are unlikely to profit from playing poker online. Additionally, under his analysis, hundreds if not thousands of hands are necessary for a "skilled" player's cumulative performance to be likely to beat that of an "unskilled" player at a high confidence level.

Absolute Versus Relative Performance

- 15) The first major error Dr. Heeb makes is that his analysis addresses relative skill rather than the likelihood that a player will earn a profit. In my opinion, poker players play poker to win money. A player will consider himself a winner if he earns a profit. The fact that he may lose less money than another player is likely to be of cold comfort. I believe that the proper metric for determining success at a session of poker is whether or not a player profits from playing the game.
- 16) In his report, Dr. Heeb defines "win rate" as the "amounts won per hand played."² He employs the concept of win rate in section III.E.3. of his report, "Evaluation of skill measurement." Dr. Heeb presents a chart titled "Average win rate for players of different predicted skill, for \$5/\$10 stakes players in the prediction group." I have included the chart below:

² Heeb's report para 46.

Figure 13: Average win rate for players of different predicted skill, for \$5/\$10 stakes players in the prediction group



17) Dr. Heeb describes this chart as follows:

Having established a formula for a skill index and having applied it to the prediction group, the question naturally arises: how well does the skill index predict actual player performance? Figure 13 below shows the relationship between “predicted skill” and the actual win rate for all players in the prediction group of the \$5/\$10 stakes games. The line slopes upward to the right, indicating that players with higher predicted skill on average have higher win rates. If poker were a game of chance, there would be no relationship between predicted skill and results. The slope of the

line reflects the much higher expected win rate of skillful players compared to less skillful players. This relationship characterizes games of skill. I find similar results for all of the stakes, as shown in the Appendix, Section IV.C.

- 18) Dr. Heeb's report does not provide the exact details of how he constructed his skill index. I submit that the court will want to know the exact methodology that he employed. If it is the case that skill is determined by subsequent winnings, then what Dr. Heeb has found is that winning is winning and losing is losing. No inference about the role of skill can be inferred from this.
- 19) Dr. Heeb admits in describing his results "[t]he results of these simulations provide clear and powerful evidence that poker differs significantly from a game of chance."
- 20) Additionally, leaving aside the potential methodological issues in Dr. Heeb's analysis (some of which I specifically address below) this chart illustrates a striking reality. Even "skilled" players (as Dr. Heeb describes those above the 50th percentile of predicted skill,) on average, incurred losses on their poker playing.
- 21) Figure 13 appears to show that players in the 51st to 75th skill percentile lost approximately .15 to .45 ("bb") per hand.³ In the \$5/\$10 game Dr. Heeb analyzes, this equates to a loss of approximately \$1.50 - \$4.50 per hand.

³ These calculations are based on the data presented in Figure 13 (and later figures) and the values may change slightly based on the exact underlying data. Dr. Heeb does not clearly address some of the details and assumptions underlying his charts so I have made several assumptions. I assume that the "Win rate(bb/hand)" refers to what a player's average return for each hand dealt is, expressed in "bb." In other words, a win rate of -1bb means that a player's average return is a loss of 1bb per hand, and a win rate of 0bb means that a player averages no gain or loss

- 22) Even top players in the 90th skill percentile appear to have, on average, suffered losses from their poker playing. Only between the 90th and 95th skill percentile does it appear that “skillful” players begin to experience a positive win rate (i.e. have a positive expected return).
- 23) In Appendix IV.C. “Average win rates for players of different predicted skill,” Dr. Heeb presents similar charts for other betting levels. In each case, on average, “skilled” players still experienced losses. Generally, it is only near the 95th percentile that players’ have positive win rates.⁴
- 24) What Dr. Heeb’s simulation actually claims to illustrate is that “skilled” players consistently outperform “unskilled” players. They do not show that such a player will be a winner in the absolute sense (i.e. that a player will leave the table with more than what he sat down with.)
- 25) Given that even the majority of “skilled” players have negative win rates under Dr. Heeb’s methodology, if a player were to make a profit at any given session in a game where he faced a negative expected rate of return, such a profit would have to be primarily as the result of luck.

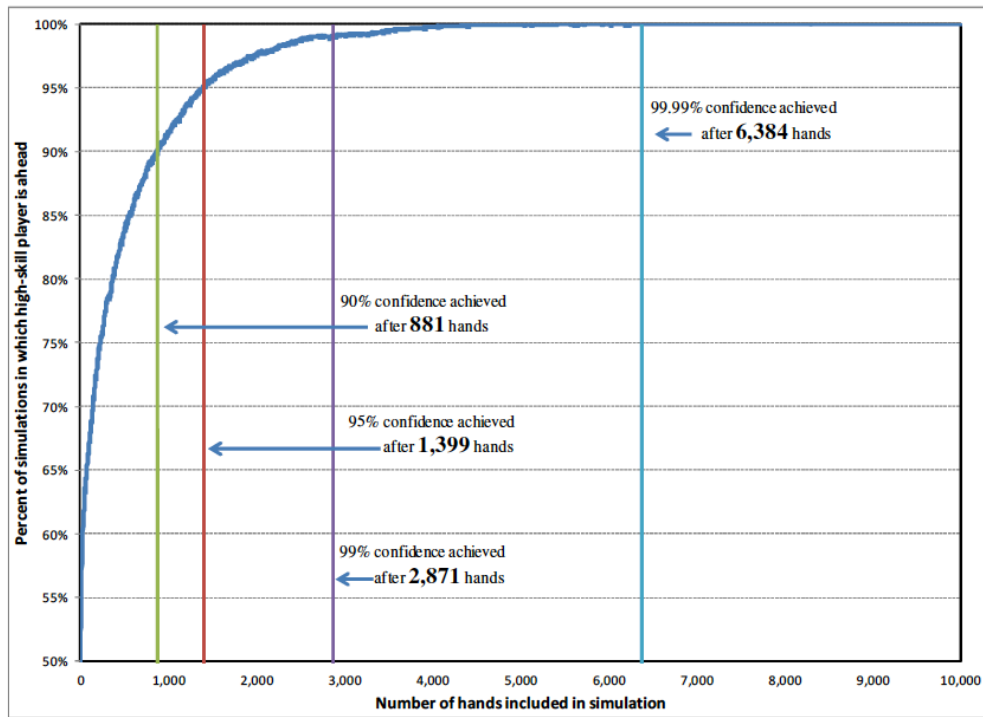
per hand. I assume that “bb” as used in these charts refers to “big blind” – a measurement that allows comparison across different betting levels. I also assume that the skill rating on the horizontal axis in this chart is a percentile, as stated in his report, rather than a score. In other words, I assume that an equal number of players would fall into the 99th percentile as would fall into the 1st and 50th percentiles.

⁴ In the case of \$10/20, the threshold appears to be near the 80th percentile.

Length of Session

- 26) As discussed above, Dr. Heeb's calculations actually claim to prove that, over the long run, "skilled" players outperform "unskilled" players.
- 27) I have three major problems with Dr. Heeb's assertions. The first is that his analysis only considers cumulative returns. The second is that Dr. Heeb's analysis is that his simulation reaches a level of statistical significance only after a number of hands much larger than any player could be expected to play in reality during a single session. The final problem is that his analysis only addresses relative performance. He does not analyze whether the players are winners in an absolute sense, simply whether or not the "skilled" player outperforms the "unskilled" player. This would include situations where both players lose money.
- 28) Dr. Heeb performed a Monte Carlo simulation – a simulation involving large, repeated series of random samplings - by first selecting a hand from the top 50% of players (according to his skill rankings), noting the resulting profit or loss, and then selecting a hand from the bottom 50% of players and noting the resulting profit or loss. He continued to do this, adding the cumulative results of these hands and tracking whether the "skilled" or "unskilled" player was ahead.
- 29) Below is a copy of Figure 16 "Percentage of the time a higher skilled player (top 50% of skill) would predominate over a lower skilled player (bottom 50% of skill) after any given number of hands at \$1/\$2 stakes"

Figure 16: Percentage of the time a higher skilled player (top 50% of skill) would predominate over a lower skilled player (bottom 50% of skill) after any given number of hands at \$1/\$2 stakes



- 30) Dr. Heeb shows that in his simulations the “skilled” player is ahead (but not necessarily winning) in 90% of the simulations after 881 hands.
- 31) The “skilled” player is ahead in 95% of the simulations after 1,399 hands, and ahead in 99.99% of the simulations after 6,384 hands.
- 32) Dr. Heeb characterizes this result by claiming that “the number of hands by which the higher skilled players predominate with a high degree of certainty could be played in a few sessions of poker.” Dr. Heeb’s analysis is based on online poker hands, which, as I noted above, I assume play with greater rapidity than live physical games. Assuming an average of 30 hands per hour, a player would have to play more than 46.6 hours with no breaks to reach the level of 1,399 hands. This seems to me to be more than “a few sessions.”

- 33) In terms of a poker player in a card room such as Mr. DiCristina operated, it is hard to imagine that a player would sit and play a session including enough hands for his “skill” to be a statistically significant factor, according to Dr. Heeb’s analysis.
- 34) Dr. Heeb’s analysis here does not show that skill predominates chance in an individual hand, an individual round, single session, or even over multiple sessions. Dr. Heeb’s analysis simply purports to show that the actions of the players has some impact on the outcome and that poker is not a game of pure chance – an assertion which no one rejects.
- 35) I further note that under Dr. Heeb’s simulation, the number of hands necessary to achieve his 95% level ranged from 1,226 (at the \$3/\$6 level) to 3,416 (at the \$10/\$20 level.)
- 36) There is one more general concern that I have with Dr. Heeb’s analysis of long-run poker playing. One cannot forget that no matter how long a player sits at a table, the probability of receiving any given hand is the same on the next hand before the cards are dealt as it was for every other hand in the game. This is reminiscent of a famous paradigm from basic probability theory. If red has come up 20 times in a row in roulette, it does not mean that “black is due.” The probability of getting red or black (or green) with each spin of the wheel is independent of prior history. From this point of view, Dr. Heeb’s analysis of long-term results is of limited value to this exercise.

Uncertain and/or Misleading Elements of Dr. Heeb’s Report

- 37) As noted above, I have not been provided with all of the data and statistical analyses summarized in Dr. Heeb’s report. However, there are several elements of the Dr. Heeb’s report that I believe are misleading or uncertain.

Dr. Heeb's Claim That Persistence of Winners Proves Skill

38) Dr. Heeb's report includes an analysis of the top winners and bottom losers at various levels of play. He claims that the persistence of winners and losers prove that a difference in skill causes this disparity. I disagree with this conclusion. Persistent winners and losers (selected after the fact) result normally from random chance variation. The presence of persistent winners and losers does not prove "skill" (or lack thereof) on their parts.

39) In section III.C. of his report, Dr. Heeb produces a chart which purports to illustrate the performance of the top 10 players in his data set at \$5/\$10 stakes (Figure 1, p. 12). He states:

Several features of the graph merit discussion. First, these players are clearly winning enough to earn a living playing poker. For example, the top player earned over \$250,000 playing \$5/\$10 stakes during the year. All of the top 10 players earned well in excess of \$100,000. In addition, these players win consistently. As the year progresses, these players' cumulative amounts won are nearly always increasing. Although they may have a few losing days or weeks, they tend to win consistently.

40) Dr. Heeb also presents a chart showing the performance of the bottom 10 players in his data series (Figure 2, P. 14). He states that:

It is also important to note that there are players that tend to lose consistently through time. In Figure 2, I provide the same chart shown above, but I add the cumulative results for the top 10 *losing* players at \$5/\$10 stakes. Notably, they are consistently losing throughout the year. The fact that the winning players tend to win

consistently and the losing players tend to lose consistently demonstrates that there is a skill differential between these groups.

- 41) Dr. Heeb claims that the performance of the top and bottom players at the \$1/\$2 level lead to the same conclusions. Namely that “the winning players tend to win consistently and the losing players tend to lose consistently, suggesting a persistent skill differential between these groups.”
- 42) From a statistical perspective, Dr. Heeb’s report does not include enough information to draw any such conclusions.
- 43) First, and most importantly, Dr. Heeb does not discuss the total number of players he analyzes at each level. Dr. Heeb’s charts show players who are “consistently winning.” However, if one were to chart the performance of players involved in a game whose outcome was determined purely by chance, one might expect to see similar results. Some players are seen – after the fact – to have consistently won. This does not prove or disprove that their winning was a result of skill.
- 44) A similar outcome can occur from pure random chance variation. To demonstrate this I performed a simulation of my own.
- 45) To simulate a game of pure random chance, I ran a simulation similar to a player flipping a coin 100,000 times for 1,000 players. The result of each flip however, in this simulation, rather than a head or tails is based on a standard bell curve - the standard normal distribution.
- 46) In this case, the expected outcome for each trial is to win, on average, zero dollars. That is, the player has an equal chance of either winning or losing an equal amount of money on any given trial.

- 47) I then plotted the cumulative winnings for each player and graphed the results for the top 10 winners and top 10 losers in the following chart. This experiment shows that in a game of pure chance, in the long run, the top winners exhibit the behavior of persistently winning while the top losers appear to be consistently losing. In fact, in any game of pure chance, in the long run, this phenomenon will repeat itself.
- 48) The top chart on the following page illustrates the results of this simulation. The bottom chart contains Figure 3 from page 16 of Dr. Heeb's report which shows the top 10 winners and bottom 10 losers at the \$1/\$2 game.

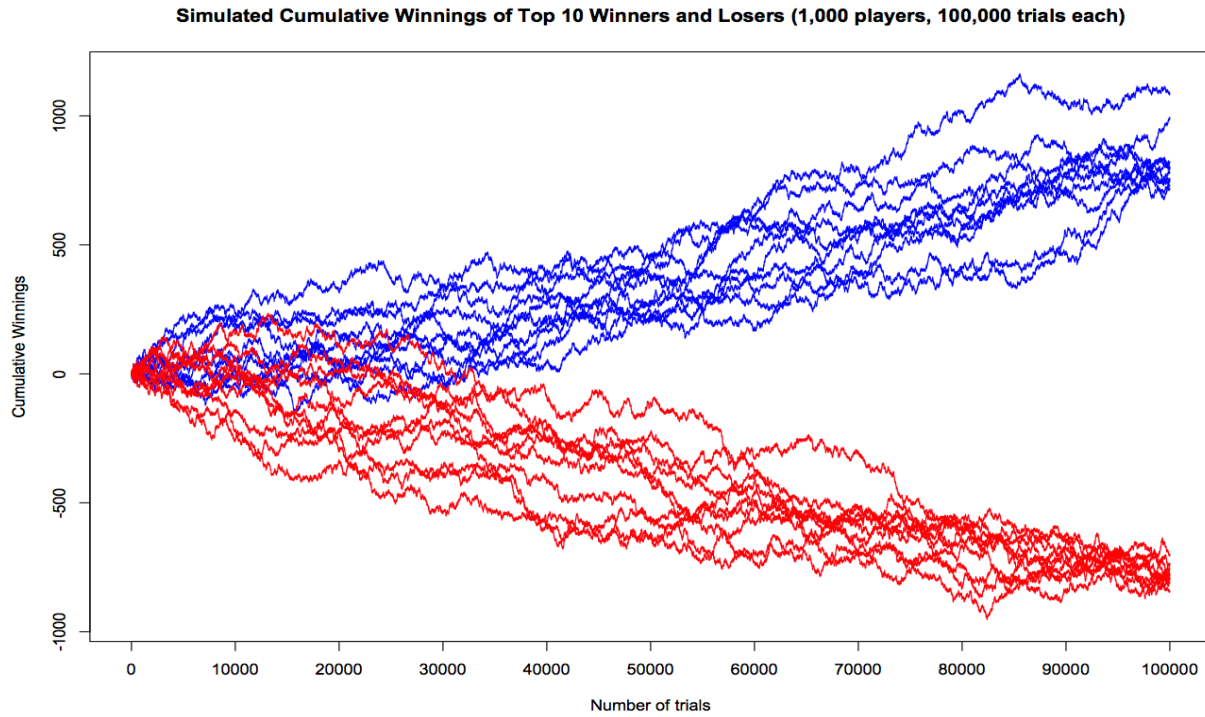
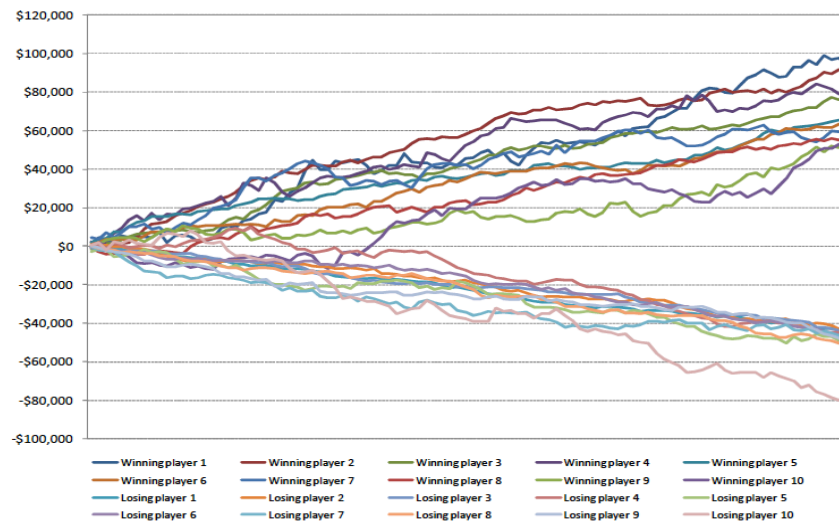


Figure 3: Winnings through time (April 2010 through March 2011) for the top and bottom 10 players in terms of total dollar amounts won or lost at \$1/\$2 stakes



Note: For illustrative purposes, in this figure all the hands played by each player are distributed evenly from left to right across the graph. Thus, for example, the midpoint of the graph marks the midpoint of each player's playing history. Some players played more hands than others, and they may have played them at different times. However, all of the players depicted in the graph played a high volume of hands.

49) Dr. Heeb's Summary statistics for the top 50 winning and bottom 50 losing players in Appendix IV.A. are equally instructive.

50) In paragraph 42 of his report, Dr. Heeb states that:

Dividing the play of the top 50 players at \$1/\$2 stakes into individual monthly results, 439 of these months were winning months, and only 117 months were losing months. In contrast, dividing the play of the 50 largest *losing* players into individual monthly results, only 85 of these months were winning months, and 437 months were losing months. Again, the substantial and persistent disparities between the top winning and losing players demonstrate a persistent skill differential between the two groups. I find similar disparities for all of the stakes, as shown in the Appendix, Figure 17 of Section IV.A.

51) Dr. Heeb claims that the statistics he presents show that winning players win consistently and losing players lose consistently. However, as noted above, without the complete underlying data, it is not clear whether this performance is attributable to skill or simply a result of random chance variation.

52) Indeed, such a calculation (determining whether an outcome is likely to be the result of a specific input – in this case the “skill” of the player – or a result of random chance) is a standard statistical tool which, although he applies to other statistics in his report, Dr. Heeb does not apply in this instance.

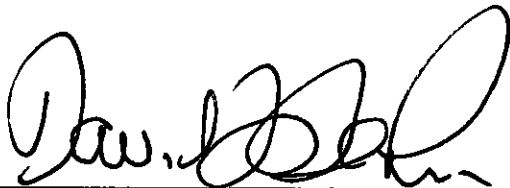
53) The table also illustrates that even for the top 50 winning players at the higher stakes levels (\$5/\$10 and \$10/\$20) their purported skill advantage did not prevent them from experiencing losing months 25-30% of the time. Additionally, each month presumably involved multiple sessions.

Dr. Heeb's Skill Rankings

- 54) One methodological issue I have with Dr. Heeb's analysis arises from Footnote 7 on page 36 of his report. The footnote states that "[p]layers with too few hands played to calculate statistics for all the various hand and position combinations are assigned the lowest skill level, accounting in large part for the flat portion of the curve on the left." By assuming that players that play "too few" hands are unskilled, Dr. Heeb skews his results. It may be the case that such players are, in fact, skilled, but choose to stop playing after several losses.
- 55) I note that Dr. Heeb does not indicate in his report what is his cutoff. In other words, must a player play at least one of each of the 169 possible starting hands to be included and assigned a skill rank, must he play each hand some multiple number of times, etc. Given that there are 169 hand combinations, and Dr. Heeb excluded players whose record did not provide enough information to make statistical determinations, this could theoretically mean that Dr. Heeb arbitrarily judged players who played over a hundred – or hundreds of hands – to be of low skill.
- 56) The impact on his analysis is that Dr. Heeb categorizes players who play few hands as "unskilled" players. These players could be "skilled" players who only played a few number of hands and then quit because they were losing.
- 57) If we assume the reasonable possibility that a player who plays several hands and loses may then choose to quit – regardless of his level of "skill" – Dr. Heeb's analysis is slanted to presuppose that loser is unskilled.
- 58) The assumption, therefore, could cause a self-serving bias in Dr. Heeb's analysis. A player only plays a few hands because he loses. He is then assumed to be unskilled and therefore the expected loss of unskilled players increases.

The Source of Dr. Heeb's Data

- 59) Dr. Heeb bases his analysis on data regarding 415 million hands played on the online site PokerStars between April 2010 and March 2011. He states that he verified the data from HandHQ "a company that tracks hands played on PokerStars and other online poker sites."
- 60) Without access to the underlying information and greater detail on its collection, I can only offer a few comments.
- 61) I am not challenging Dr. Heeb's integrity, but I raise the concern that the data upon which he relied is not real. Whether my suspicions are correct or not, I would assume that the court would want further information assuring that the data is based on real hands played by real players and further information on HandHQ. Additionally, I believe it is essential to confirm that HandHQ's data is derived independently from the PokerStars data.
- 62) I add that PokerStars is based on the Isle of Man, and was sued by the U.S. Attorney's office for the Southern District of New York over the charge that its transactions with U.S.-based poker players involved violations of federal bank fraud and anti-money laundering laws.

A handwritten signature in black ink, appearing to read "David F. DeRosa", with a stylized flourish at the end.

David F. DeRosa Ph.D.

Exhibit 1: David DeRosa's CV

DeRosa Research and Trading, Inc.

495 White Oak Shade Road
 New Canaan, CT 06840
 Tele (203) 801-4340 Fax (203) 801-4342
derosa@derosa-research.com

Dr. David DeRosa**Education**

The University of Chicago, Graduate School of Business	Chicago, Illinois
<i>Doctor of Philosophy (Ph. D.), December 1978.</i>	
<ul style="list-style-type: none"> • Fields: Finance and Economics. • Dissertation: <u>Rates of Return on Common Stocks and Inflation.</u> 	
The University of Chicago	Chicago, Illinois
<i>Bachelor of Arts (AB), August 1972.</i>	
<ul style="list-style-type: none"> • Major Field: Economics 	

Professional Experience

1997 - Present	DeRosa Research and Trading, Inc. <i>President and Owner</i>	New Canaan, Connecticut
	<ul style="list-style-type: none"> • Consultant for international financial markets and derivative instruments matters. • Expert witness in foreign exchange, international finance, emerging markets, derivatives, and risk management. • Commodity Trading Advisor (effective May 1998). 	
1998 - 2004	Bloomberg News <i>Financial Columnist</i>	New Canaan, Connecticut
1996 - 1997	Quadrangle Investments, LLC <i>Co-Founder and Managing Partner</i>	Greenwich, Connecticut
1993 - 1996	Swiss Bank Corporation <i>Director, Foreign Exchange Trading</i>	New York, New York
1992 - 1993	BEA Associates <i>Vice President and Derivatives Portfolio Manager</i>	New York, New York
1988 - 1992	Alliance Capital Management L.P. <i>Vice President - Derivatives and Synthetics</i>	New York, New York
1985 - 1988	DeRosa & Company <i>President and Owner</i>	Los Angeles, California
1984 - 1985	International Financial Advisers <i>Acting General Manager</i>	Kuwait City, Kuwait
1981 - 1983	Consulting Center For Finance and Investment <i>Senior Vice President</i>	Riyadh, Saudi Arabia
1980 - 1981	Wilshire Associates <i>Senior Associate</i>	Santa Monica, California
1979	Ministry of Finance and National Economy <i>Economic Advisor</i>	Riyadh, Saudi Arabia

Teaching Experience

Summer 2006 - Present	Columbia University <i>Adjunct Associate Professor in the Industrial Engineering and Operations Research Department</i> <ul style="list-style-type: none"> Instructor in graduate program in Financial Engineering. 	New York, New York
Spring 1996 - 2010	Yale School of Management <i>Adjunct Professor of Finance</i> <ul style="list-style-type: none"> Instructor for advanced graduate courses in financial management, international finance, financial policy in emerging markets, foreign exchange, derivatives, and asset management. 	New Haven, Connecticut
Spring 1995 - Fall 1996	The University of Chicago, Graduate School of Business <i>Lecturer in Finance, Concurrent with Swiss Bank</i>	Chicago, Illinois
1979 - 1980	The University of Southern California <i>Assistant Professor of Finance and Business Economics</i>	Los Angeles, California
1975 - 1978	Loyola University Chicago <i>Instructor in Finance</i>	Chicago, Illinois

Boards of Directors

1999 - Present	Rubicon Fund Management <i>Director</i>
2002 - Present	BlueCrest Capital International <i>Director</i>
2003 - Present	The Children's Investment Fund <i>Director</i>
2005 - Present	GSA Capital International <i>Director</i>
2009 - Present	Pardus Funds <i>Director</i>
2010 - Present	Pendragon Event Driven Fund <i>Director</i>
2011 - Present	JPS Credit Opportunities Fund <i>Director</i>
2011 - Present	OneWall Advisors <i>Director</i>
2005 - 2006	CCC Carbon Fund <i>Director</i>
1998 - 2004	Midwest Independent Transmission System Operator <i>Director, Chairman of the Markets Committee, Member of the Finance and Audit Committee</i>

Books

Options on Foreign Exchange, 3rd ed. John Wiley & Sons, 2011.

Central Banking and Monetary Policy in Emerging Markets Nations, Research Foundation of the CFA Institute, 2009.

In Defense of Free Capital Markets: The Case Against a New International Financial Architecture, Bloomberg Press, 2001. (Turkish language edition, Simple Chinese edition).

Currency Derivatives, John Wiley & Sons, 1998.

Managing Foreign Exchange Risk, Revised Edition, Irwin / McGraw-Hill, 1996 (Japanese Language Edition, Yuuhikaku, Tokyo).

Chapters, Articles and Seminars

“The Sovereign Debt Constraint” Foundation Financial Officers Group, Washington D.C. April 27, 2012, Speaker.

“Central Banking and Monetary Policy in Emerging Markets Nations” CFA Society of Tucson, September 15, 2010, Speaker.

“The International Funds Conference” January 9, 2008, Speaker.

“China’s Defense of the Peg Perpetuates Central Planning” Cato Journal, Vol. 25, No. 1 (Winter 2005).

“Financial Markets and Legal Ambiguity” Columbia University Practitioners in Mathematics of Finance Conference, October 2003.

“Memo to Argentina: Dollarize or Die” Newsweek, December 17, 2001.

“Innovations in World Monetary Policy” Columbia University Practitioners in Mathematics of Finance Conference, September 15, 2001.

“Recent Innovations in Japanese Monetary Policy” Yale University, August 1, 2001.

“The Capital Mistress: Free Market Models and the Global Economy” Harvard International Review, Summer 1999.

“Emerging Markets and Currency Crises” CFA Institute Conference Proceedings Quarterly, 1999.

“Foreign Exchange Hedging by Managers of International Fixed Income and Equity Portfolios” Handbook of Portfolio Management, edited by Frank J. Fabozzi. New Hope, PA: Frank J. Fabozzi Associates, 1998.

“Going Along for the Ride” Newsweek, June 22, 1998.

“Currency Management for Global Bond Portfolios” AIMR Conference Proceedings, Global Bond Management (November 1997): 71-76.

“The Southeast Asian Currency Crisis” New York Society of Securities Analysts, New York, Summer 1997.

“Forward and Futures Contracts on Foreign Exchange” Derivatives Quarterly, Institutional Investor, Fall 1994.

“Using Derivatives to Manage the Currency Risk in Global Investment Portfolios” AIMR Conference Proceedings, Derivative Strategies for Managing Portfolio Risk (December 1993): 92-97.

“Introduction to Currency Options” The Journal of Investing, Summer 1993.

“An Option-Based Approach to Currency Risk Mangement” Strategic Currency Investing, edited by Andrew W. Gitlin. Chicago: Probus Publishing, 1993.

“Equity-Linked Cross Currency Swaps” with Philip G. Nehro, Cross Currency Swaps, edited by Carl R Beidleman. Homewood, IL: Business-One Irwin, 1992.

“An Introduction to Currency Insurance” *Global Portfolios – Quantitative Tools for Maximum Performance*, edited by Robert Aliber and Brian Bruce. Homewood, IL: Dow Jones-Irwin, 1991.

Expert Witness

Stokors SA, Lucien Selce, and Phoenicia Assets Management (Holding) SAL v. IG Markets Limited – Expert Reports and Witness Statement for High Court of Justice, Queen’s Bench Division, Commercial Court (June 2012)

Shasta Strategic Investment Fund LLC; and Presidio Growth LLC (Tax Matters Partners), et. al. v. United States of America – Expert Report for Northern District of California (June 2012)

David Gillis and Ester Sidis v. Societe Air France, The Greater Toronto Airport Authority, and NAV Canada – Expert Report for Ontario Superior Court of Justice (May 2012)

United States of America v. Myron Gushlak – Declaration and Testimony for Eastern District of New York (February 2011)

Allied Irish Banks, P.L.C. v. Bank of America & Citibank – Expert Report and Deposition for Southern District of New York (January 2012)

Pointe Du Hoc v. Commissioner – Expert Report for United States Tax Court (October 2011)

V.I. Derivatives, LLC v. United States of America – Expert Report for District Court of the Virgin Islands (October 2011)

AD Global FX Fund et al. v. United States America – Expert Report and Deposition for Southern District of New York (July 2011)

Aventuri Trading v. Commissioner of Internal Revenue – Expert Report for Tax Court (May 2011)

United States of America v. Daugerdas et al. – Testimony for Southern District of New York (April 2011)

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